INSTRUCTION MANUAL

MOTOR PROTECTION RELAY

S2E21

TOSHIBA CORPORATION

REV 1

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Rev 1 TYPE S2E21-C1A□ VERSION 1.01

1. INTRODUCTION

This manual (describes the handling. use and operating principle of type S2E21 Multifunction Motor Protection Relay.

The S2E21 is a motor protection relay and monitor incorporating protective features for 3-phase induction motor and motor monitor units having such functions as motor temperature and operation trends.

S2E21 has the following features.

(1) Temperature-based protection adopted for overload protection unit:

The overload protection function employs a temperature-based protection method that calculates the motor temperature rise from the motor's heat characteristic and motor current and provides optimum protection for various kinds of motors.

(2) Large LCD screen:

The large easy-to-read LCD screen makes the S2E21 highly operable.

(3) All protective functions necessary for motor circuits integrated:

The S2E21 incorporates all protective functions necessary for the motor circuits, including overload. short-circuit, overcurrent, unbalance, undercurrent, ground overcurrent, directional ground, abnormal starting and starting failure, and repeated starting.

(4) A variety of motor management information available:

The S2E21 offers a variety of information useful for motor management and maintenance, including motor temperature, number of starts made. operation time, current trend at fault and operation history.

(5) Communication and memory card equipped as standard:

The S2E21 comes standard with a communication port (RS485) and a memory card, facilitating the setting, setting charges and motor monitoring.

(6) Monitor (to be purchased separately) makes the maintenance work very easy.

2. GENERAL SPECIFICATION

This chapter summarizes general specifications. functions and protective characteristics of the S2E21. This data will help you understand the S2E21.

2.1 Rated Performance

The rated performance of the S2E21 is shown in Table 1.

Table 1 Rated Performance

Item		Specification
Control supply		100 to 120 VAC (+10%, -15%) 50/60 Hz or 100 to 125 VDC (+10%, -15%)
Performance	Dielectric strength	2000 VAC 1 min (between terminals tied together and earth: except for RTD. communication and transducer terminals)
	Vibration resistance	16.7 Hz, composite amplitude 0.3 mm 2 hours (JEM 1355)
Applicable environment	Service temperature	-10% to 60℃ (LCD: -10C to 50℃)
	Storage temperature	-10℃ to 60℃
	Service humidity	20 to 90% RH (no dew condensation)
	Ambient	Free from dust or corrosive gases
	Altitude	Lower than 2000 m (6600 ft) For greater than 2000 m, consult factory.
Input and output	Current input	1 A or 5 A
	Operation input	100 to 120 VAC (Operation signal line input current: about 5 mA) 100 to 125 VDC
	Contact output: Relay contact	250 VAC: 2 A (cos φ =0.4) 30 VDC: 2 A

2.2 Functions

The functions of the S2B21 are listed below.

Table 2 List of Functions

Item		Description
Protection	Overload	- Rated current: 2 to 2000 A - Heating time constant: 10 to 165 min (automatically detectable) - Cooling time constant: 10 to 500 min (automatically detectable) - Allowable temperature rise: 60 to 125 ℃
	Short-circuit**	- Operating current: 5 to 17 times the rated current setting ±15% - Operating time (phases independent of each other): less than 50 ms
	Overcurrent**	- Operating current: 1.5 to 10 times the rated current setting ±15% - Operating time (phases independent of each other): 0.3 to 1 s ±10%

Table 2 List of Functions (cont.)

Item		Description
Protection	Unbalance'"	- Operating current: 3-phase average current is more than 50% of the rated current setting, ±10% - Unbalance factor: 5 to 30% - Operating time: less than 4 s
	Undercurrent'"	- Operating current: 0.30 to 0.80 times the rated current setting, ±10% - Operating time: 1 to 5 s ±10%
	Ground overcurrent'"	- Operating current: 5 to 40 times the ZCT rating, ±10% - Operating time: 0.1s +40%, -0% 0.2s to 1.5s ±20%
	Directional ground	Three kinds of directional ground modules are available: 10 A grounded system type, ungrounded system type, and a capacitor-voltage-division type (*3). For detail, see the following manuals: 6F9E010E for 10 A grounded system type; 6F9E0107 for ungrounded system type: 6F9E010E for capacitor-voltage-division type

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Table 2 List of Functions (cont.)

Item		Description
Protection (cont.)	Locked-rotor and starting failure"	- Starting current: 1.5 to 15 times the rated current setting (automatically detectable) - Starting time: 1 to 60 s (automatically detectable) - Allowable locked-rotor time: 1 to 130 s
	Repeated starting	Automatically set from the starting current and starting time.
	External fault	External fault input: 2 points
'nput	3-phase current	1 A or 5 A (3 phases independent of each other) Burden: 1 mVA or less
	Zero-phase current	1 A or 5 A Burden: 3 mVA or less
	Temperature measuring resistor input (RTD)	- 3-wire type: 8 points - Kind of temperature-measuring resistor: Selectable from Pt 100 Ω, Pt 100 Ω (JIS), Ni 100 Ω, Ni 120 Ω - measuring range: -20 to 200 ℃ - Wiring distance: 1 km (3300 ft) maximum - Resolution: 1 ℃ - Measuring cycle: 16 s

Table 2 List of Functions (cont.)

Item		Description	
Input (cont.)	External reset	1 point: 100 to 120 VAC, 50/60 Hz, about 5 mA; 100 to 125 VDC	
	External fault	2 independent points: 100 to 120 VAC, 50/60 Hz, about 5 mA; 100 to 125 VDC	
Output	Trip output; Alarm output; Start block output; Error output	1C 1NO/NC @PDT/Form C; AC: Breaking capacity 250 V-3.5 A (cos φ >0.4); Continuous current capacity 8 A; DC: Breaking capacity 30 V-5 A (L/R=0)	Selectable between energization upon operation (non-failsafe) and energization at normal (failsafe)
	NOTE: *2: Function can be locked off (non-functional). *3: ZPD and ZCT are special current transformers. (Consult factory)		

Table 2 List of Functions (cont.)

Item		Description
)utput (cont.)	Analog transducer	4 to 20 mA: 1 point Output: Selectable from among R-phase current, S-phase current. T-phase current, 3-phase average current. stator temperature rise. rotor temperature rise, RTD 1 to 8. and zero-phase current Maximum burden: 500 Ω (including cable and impedance) Output accuracy: ±2% Signal update interval: 0.5 seconds
	Communication	Scheme: RS485 half-duplex start-stop synchronization. 1 Ch Communication speed: 4800 bps Number of connectable S2E21's: 31 Communication distance: 1 km (3300 ft) Host : J3100/T3100, dedicated software available (purchased separately)
	Memory card--	Compatible type: Toshiba MCA 5101BA# Type: S RAM Capacity: 32 kbytes

Table 2 List of Functions (cont.)

Item		Description		
Indication	Power supply	Green: Lights up when control power is supplied.		
	Motor operation	Red: - Off when the motor is stopped. - Blinks at l-second intervals when the motor is starting. - Lights steady when the motor is running. - Blinks at 0.3-second intervals when the motor is overloaded.		
	Error	Red : Lights when an error is detected.		
	Protection operation	Yellow: Lights when the protection function is activated.		
	Current		3-phase (independent)	zero-phase
		Current detection range	5 to 1700% of CT rating	0.5% to 170% of ZCT rating
		Accuracy	±2.5% at CT, ZCT rating	
		Updating of display	Every 0.5 seconds	
		Analog bar indication	Used	

Table 2 List of Functions (cont.)

Item		Description	
Indication (cont.)	Current (cont.)	Ratio with respect to rating	Percent digital indication with respect to rated current
	Stator temperature rise: Rotor temperature rise	Display of calculated stator and rotor temperature rises. Updated every 0.5 seconds. Display: - Digital indicationof temperature rise - Digital indication of ratio of temperature rise to allowable value - Analog indication of ratio of temperature rise, to allowable value	
	Unbalance factor	Digital indication of unbalance factor	
	RTD temperature	Digital indication of measured temperature (6 Ch)	
	3 phase starting current	Starting current at the last start, 3 phases independent	
	Average starting current	Average starting current for the last 5 starts	

Table 2 List of Functions (cont.)

Item		Description
Indication (cont.)	Starting time	Starting time at the last start
	Average starting time	Average starting time for the last 5 starts
	Running time for latest start	Running time after the last start
	Maximum current value	Maximum current (of 3 phases) (resettable)
	Number of starts	Total number of starts (resettable)
	Total running time	Total running time (resettable)
	Event	Displays the latest 14 events such as starting, stopping, tripping. etc.
	Number of starts made in one day	Displays the daily start numbers for 14 consecutive days.
	Maximum number of starts made in one day	Displays 3 largest daily start numbers.

Table 2 List of Functions (cont.)

! tern		Description			
ndication (cont.)	Measured value at trip	Displays measured values at time of tripping.			
	Current trend before trip	Displays 10 seconds of I-set-interval current trend: for R. S, and T phase currents and zero-phase current that existed immediately before the trip.			
	Mach.ID	Unique code for S2E21 (machine number)			
	Time	Displays the presents time: year (last 2 digits), month, day, hour. minute. second.			
		Code	Display page	Setting (indication)	Value at shipping
ett ing	CT primary __ rating	CT	20	5 to 2000 A.	5
	ZCTprimary rating	ZCT	20	50 to 100 A	50

Table 2 List of Functions (cont.)

Item		Description			
'Setting (cont.)	Rated current	IN	2C	40 to 100% (with respect to CT primary rating)	40
	Motor heating time constant	TR	21	10 to 165 minutes	1C
	Motor cooling time constant	TD	21	10 to 500 minutes	10
	Stator allowable temperature rise	θSM	21	60 to 125 ℃	60
	Stator rated temperature rise	θSN	21	1C to 125 ℃ Temperature rise during rated load operation (rated current)	50
	Short-circuit current setting	I>>	22	5 to 17 times (with respect to rated current)	OFF
	Current setting for overcurrent	IOC	22	1.5 to 10 times (with respect to rated current)	OFF
	Tine setting for overcurrent	TOC	22	0.3 to 1 second	0. 3

Table 2 List of Functions (cont.)

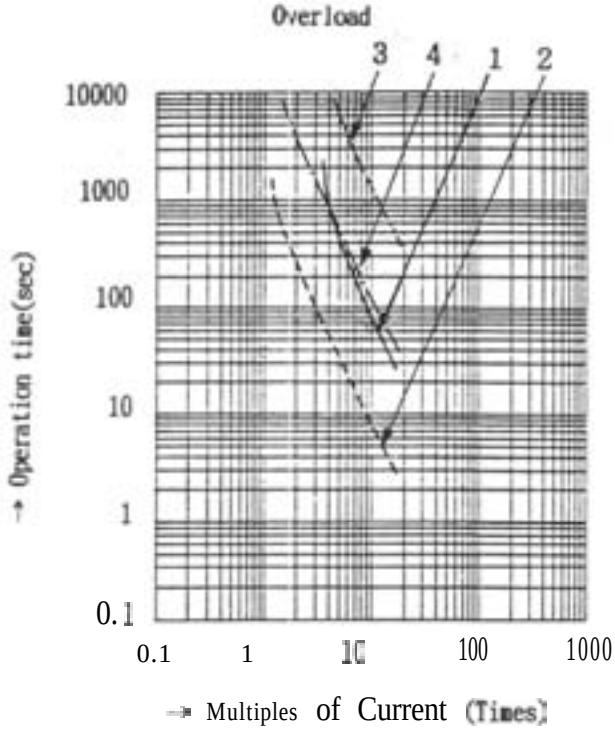
tem		Description			
	Unbalance factor setting	UE	23	5 tc 30%	OFF
etting (cont.)	Current setting for undercurrent	IUC	23	3C tc 80% (with respect tc rated current)	OFF
	Time setting for undercurrent	TUC	23	1 tc 5 seconds	1
	Current setting for ground overcurrent	IOCG	24	5 tc 40% (with respect tc ZCT primary rating)	OFF
	Time setting for ground overcurrent	TOCG	24	0.1 tc 1.5 seconds	0.1
	Allowable locked-rotor time	TSC	25	1 tc 13C seconds	OFF
	current			respect tc rated current)	
	SCommunStimeing	1st	25	1.tt6Tsecond(with	0

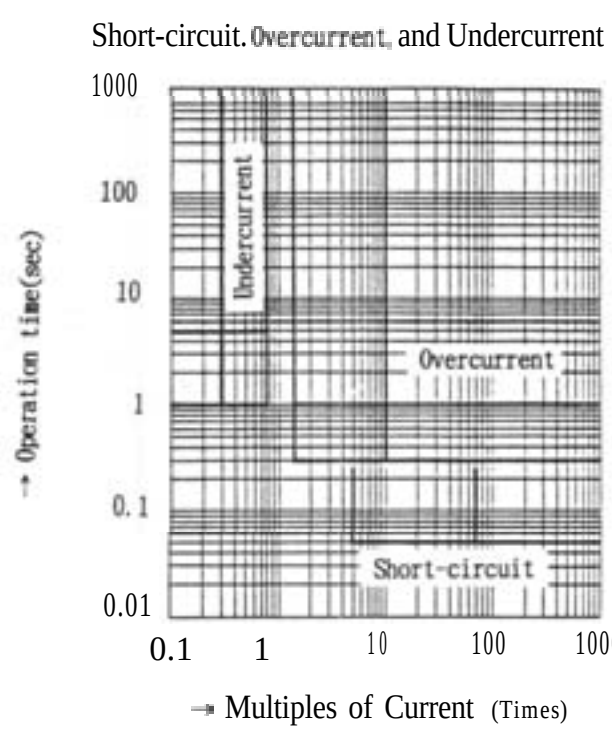
Table 2 List of Functions (cont.)

Item		Description			
jetting (cont.)	Memory card setting	—	27		
	Alarm reset level	—	28, 33		
	Output relay	—	29, 30		Non-failsafe
	ATD output	—	31		OFF
	RTD category	—	32		OFF
	Automatic detection	—	34		No detection
	Pass ID	PASS ID.	0	8 alphanumeric characters	PASS.ID.

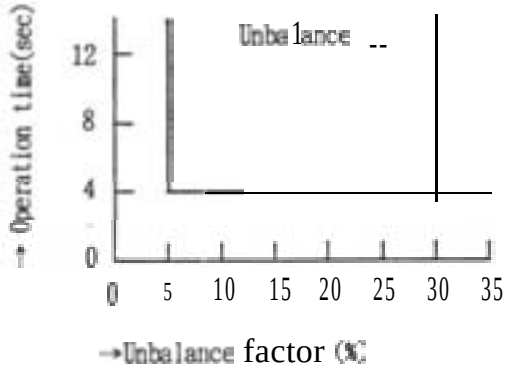
2.3 Protect ion Curves

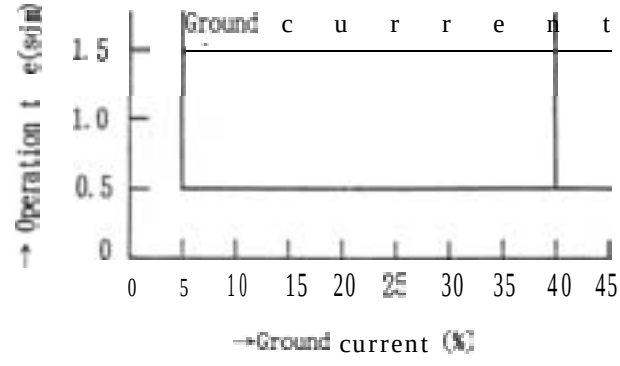
The protection characteristic curves are shown in Figure 1.





No.	Heating time constant (min)	Allowable temperature rise (℃)	Rated temperature rise (℃)
1	10	125	10
2	10	125	100
3	165	125	10
4	165	125	100





(ratio with respect to ZCT rating)

Figure 1 Protection Characteristic Curves

3. APPEARANCE AND CONFIGURATION

This chapter offers description on appearance, configuration and component names as well as functions of the S2E21.

3.1 S2E21-C1A* (without DG)

The external view of S2E21-C1A* with no ground directional unit is shown in Figure 2, its configuration in Figure 3, and its external dimensions in Figure 4. The components names and functions are listed in Table 3.

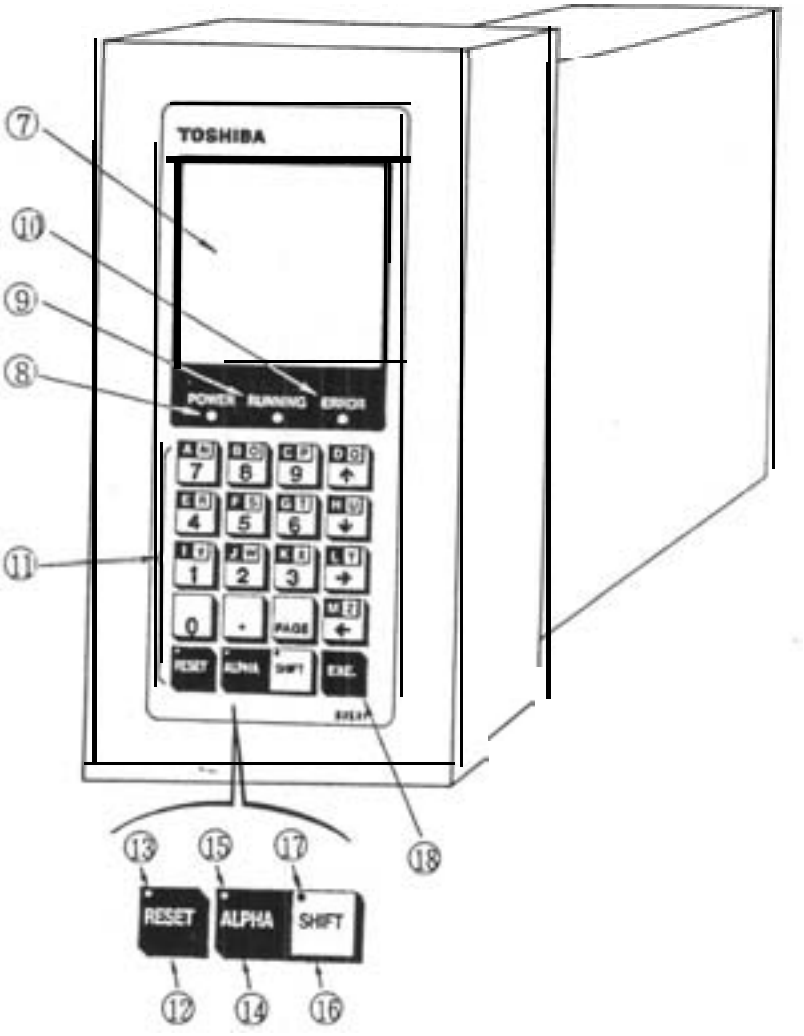


Figure 2 External View of S2E21-C1A* (without DG)

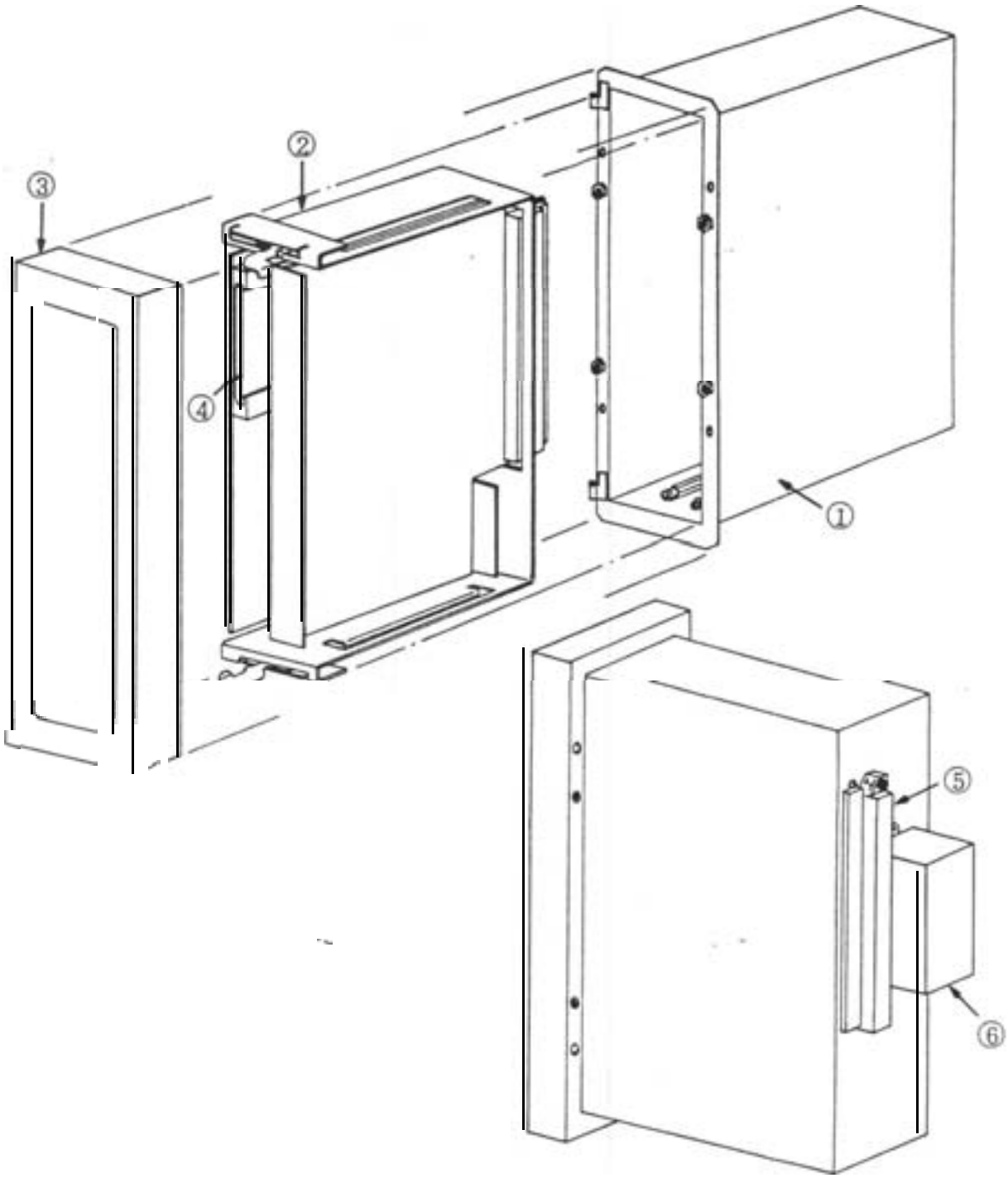
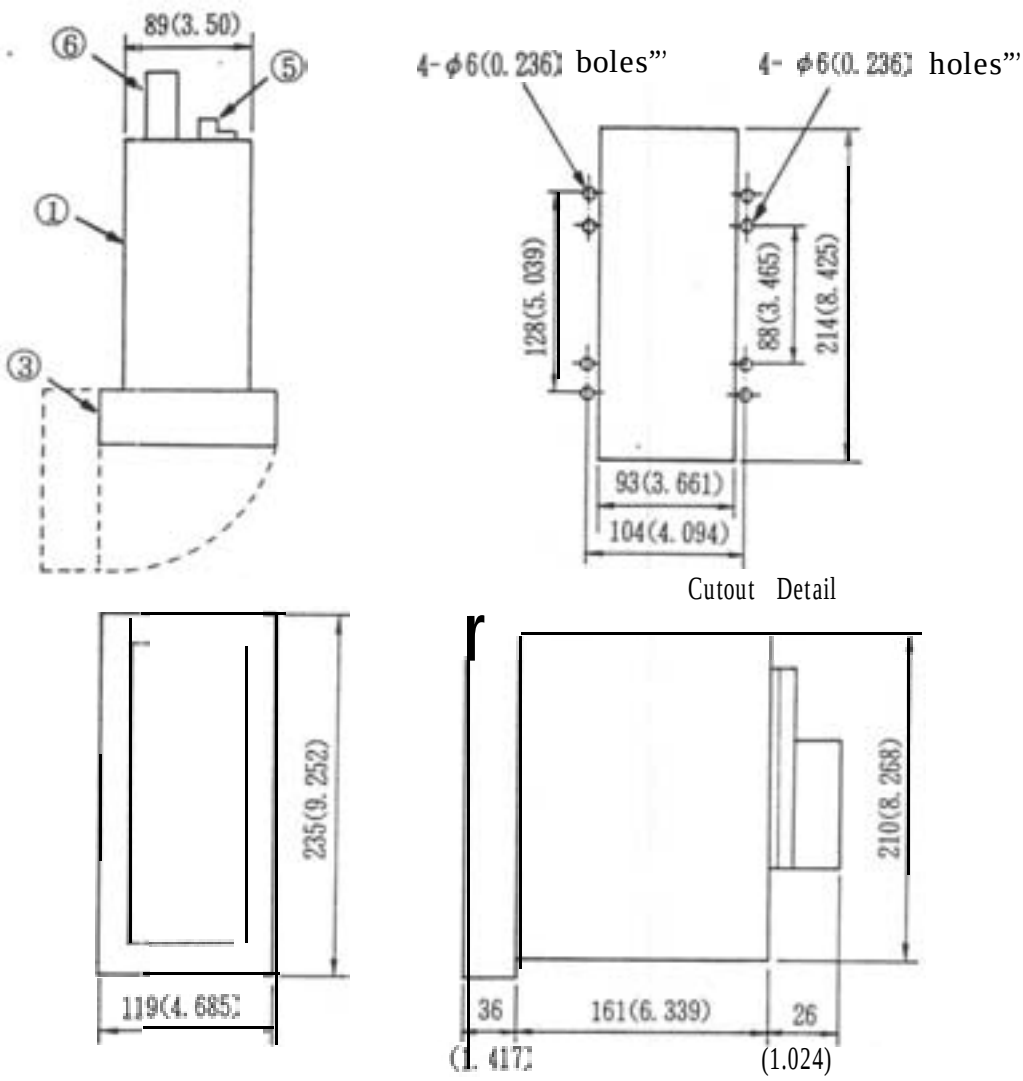


Figure 3 Configuration of S2E21-C1A* (without DC)



Dinesions in ■■ (inches)

Figure 4 External Dimensions of S2E21-C1A* (without DG)

3.2 S2E21-C1A[ ] (with DG)

The external view of S2E21-C1A[ ] with a directional ground unit is shown in Figure 5, its configuration in Figure 6, and its external dimensions in Figure 7. The components names and functions are listed in Table 3.

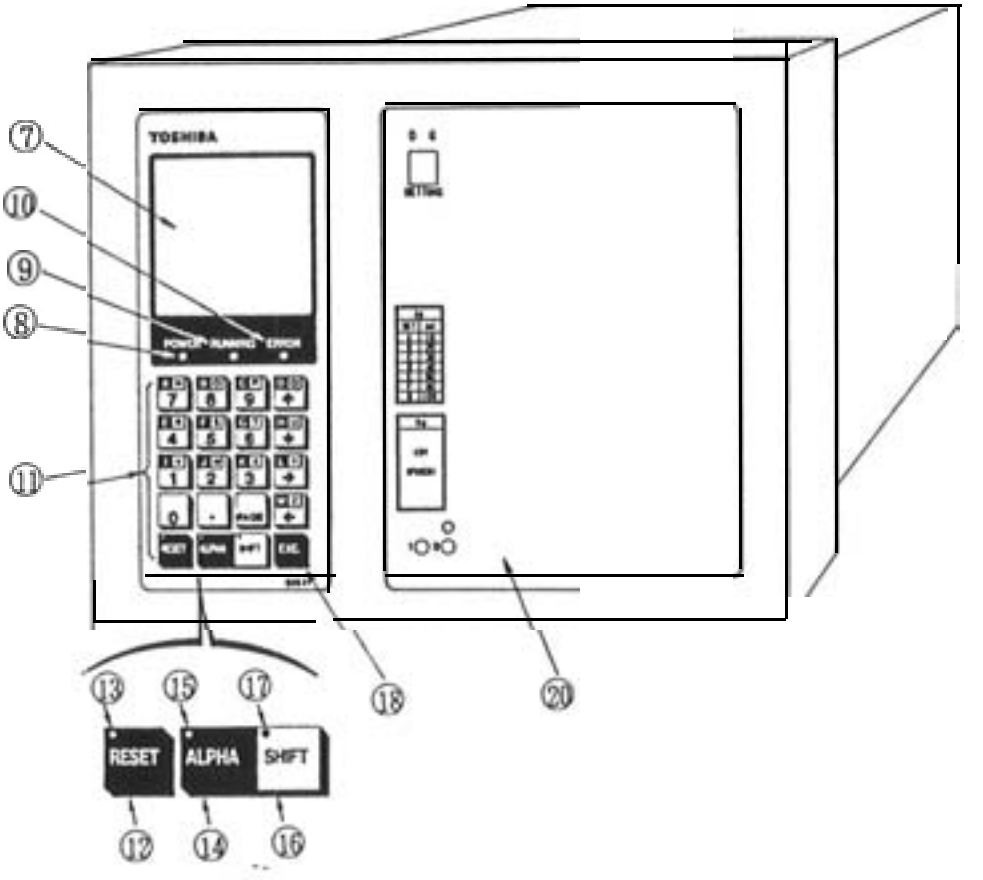


Figure 5 External View of S2E21-C1A[ ] (with DG)

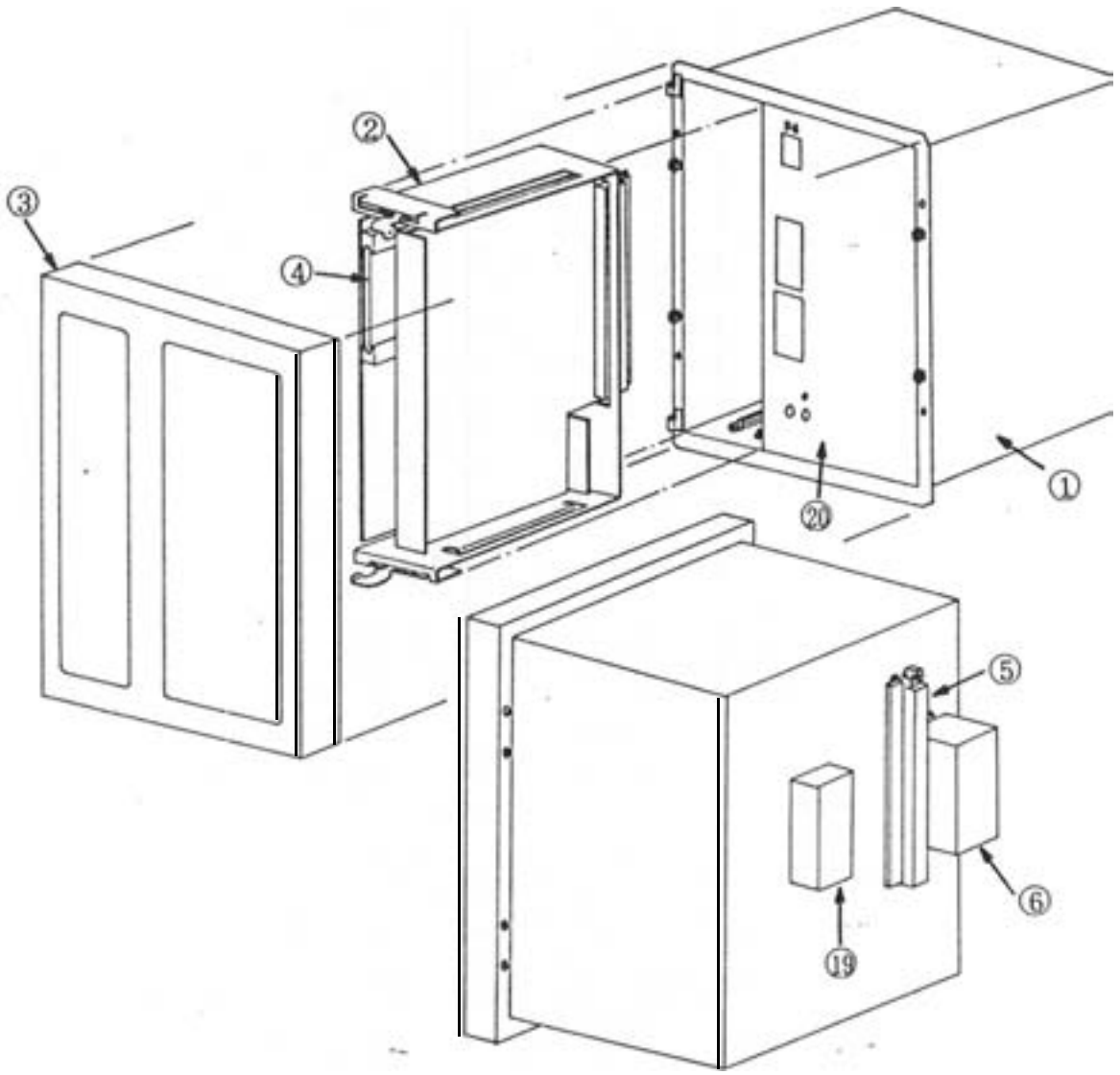
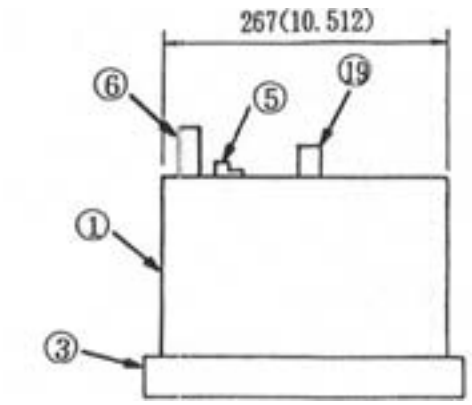
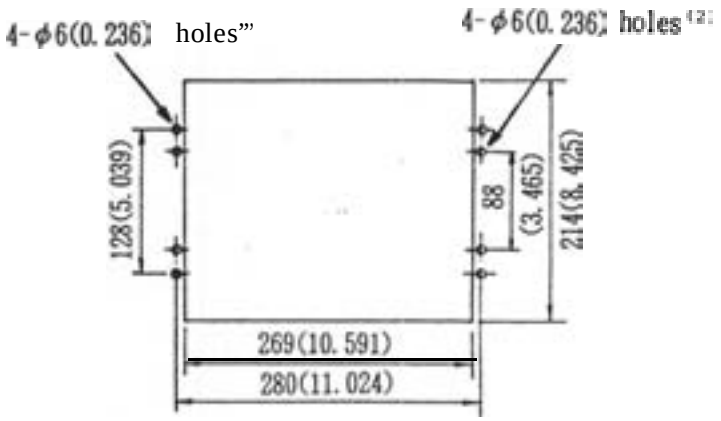
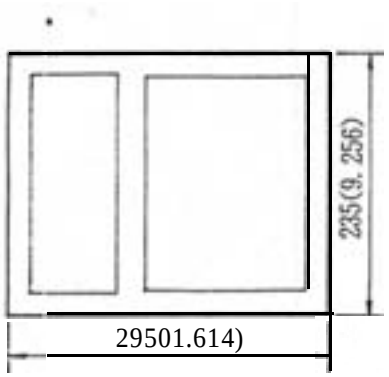


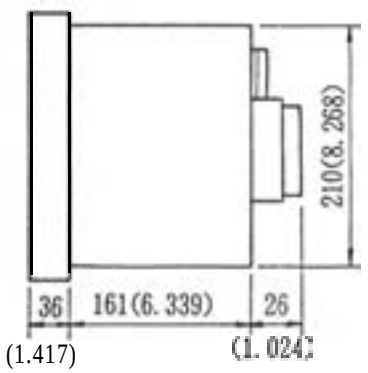
Figure 6 Configuration of S2E21-C1A[1 (with DG]





Cutout Detail





Dimensions in mm (inches)

Figure 7 External Dimensions of S2E21-C1A[ ] (with DG)

Table 3 S2E21 Components' Names and Functions

No.	Name	Function. Operation. Indication
1	Case	Case with which to mount the S2E21 to the panel for support and protection of S2E21.
2	Unit	A drawout type unit incorporating printed circuit boards When drawn out, the CT circuit is automatically short-circuited on the case side.
3	Display and operation section	Liquid crystal display (LCD), LED lamps, control switches are mounted on this section, by which can be swung open and closed by left side hinge. (For detail see Section 5.3.)
4	Memory card	One memory card is installed on the printed circuit board in the unit. The memory card can be inserted or taken out by opening the display and operation section. (For detail, see Section 5.11.)
5	Input/output terminal block	'This terminal block is for power supply, process input/output and sensor input. This is a clamp type and requires no crimp terminals for wiring.
6	Current input terminal block	This terminal block receives 3-phase current and zero-phase current.

Table 3 S2E21 Components' Names and Functions (cont.)

No.	Name	Function. Ooeration. Indication
7	Liquid crystal display (LCD)	A large LCD with a display capacity of 16x16 characters used for exchanging information with the S2E21. (For detai 1, see Section 5.)
8	Power supply indication	This lights-up in green when power. is supplied to the S2E21.
9	Operation indication	Indicates the operation condition of the motor. At rest: Light off. Running: Light on (steady). Starting: Light blinks at l-second intervals. Over 1 oaded : Light blinks at 0.3-second intervals.
10	Error indication	Red lamp lights up when the S2E21 selfmonitoring detect abnormal i ty.
11	Input keys	Used to enter alphanumeric inputs and move cursor.
12	Reset key	Used to reset the S2E21 when it has operated for protective function.
13	Indication of protection operation	Yellow lamp lights up when the S2E21 has operated for protective function. It goes off upon being reset.

Table 3 S2E21 Components' Names and Functions (cont.)

No.	Name	Function. Operation, Indication
14	Alphabet mode key	Used to enable the alphabet input mode that allows an operator to enter alphabet characters from the input keys. Characters A to M can be entered. Pressing the alphabet mode key again returns you to the numerical value input mode.
15	Alphabet input mode indication	Green lamp lights up during the alphabet input mode.
16	Shift key	Used during the alphabet input mode to allow the key-in of characters N to Z.
17	Shift indication	Red lamp lights up when during the alphabet input mode the shift key is pressed.
18	Execution key	Used to execute the command entered. This key must be pressed after key input is made.
19	Directional ground module terminal block	Terminal block for power supply of directional ground relay, for output, and for input from ZCT and CPT.
20	Directional ground module	A module for detecting the operation of the directional ground unit.

4. MOUNTING AND CONNECTION

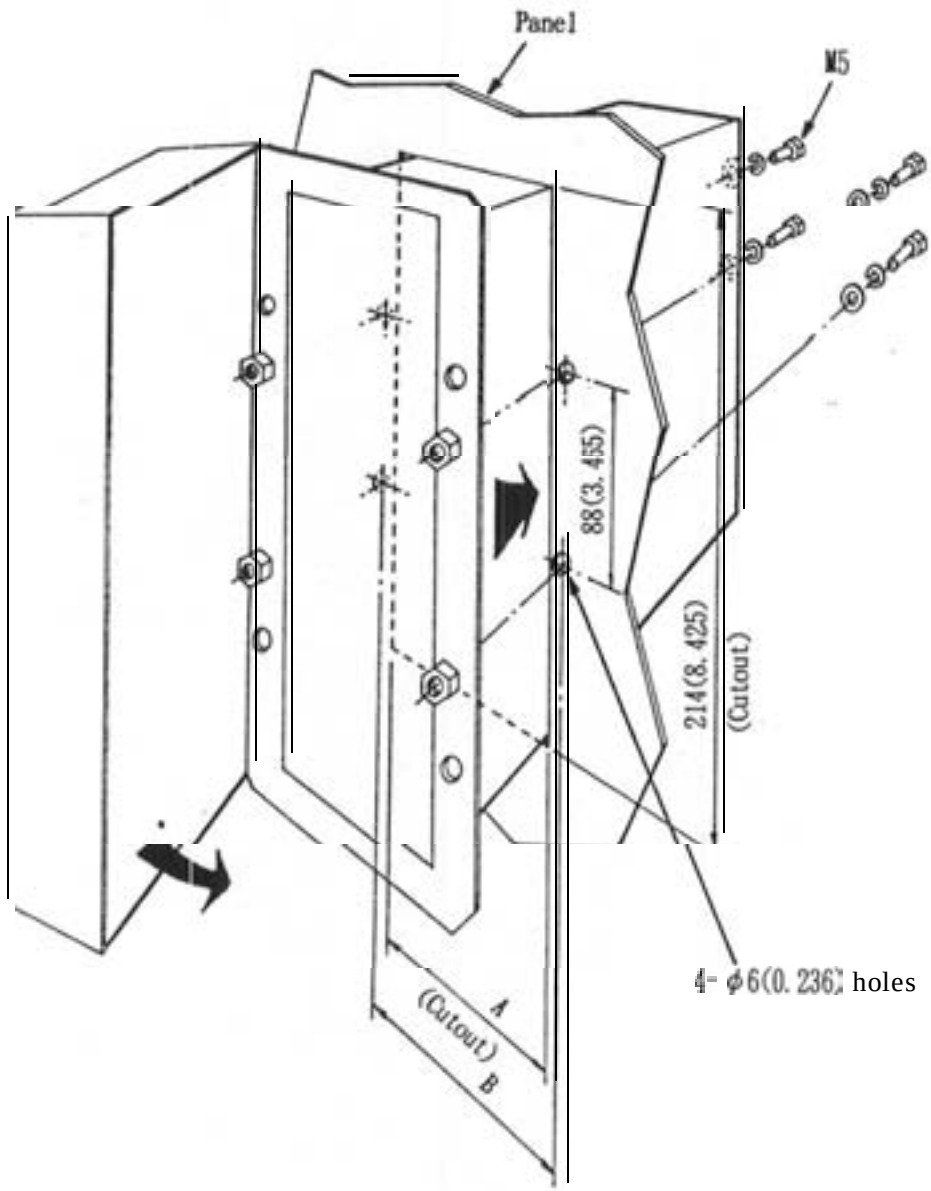
This chapter describes the procedure for mounting the S2B21 to a panel and for making connections.

4.1 Mounting

The S2B21 is mounted in the door of a panel and there are two methods for mounting it.,

4.1.1 Mounting by Standard Screws

The S2B21 has M5 nuts compatible with ISC standard. The mounting process using these nuts are shown in Figure 8. Screws and washers are not provided with the relay.



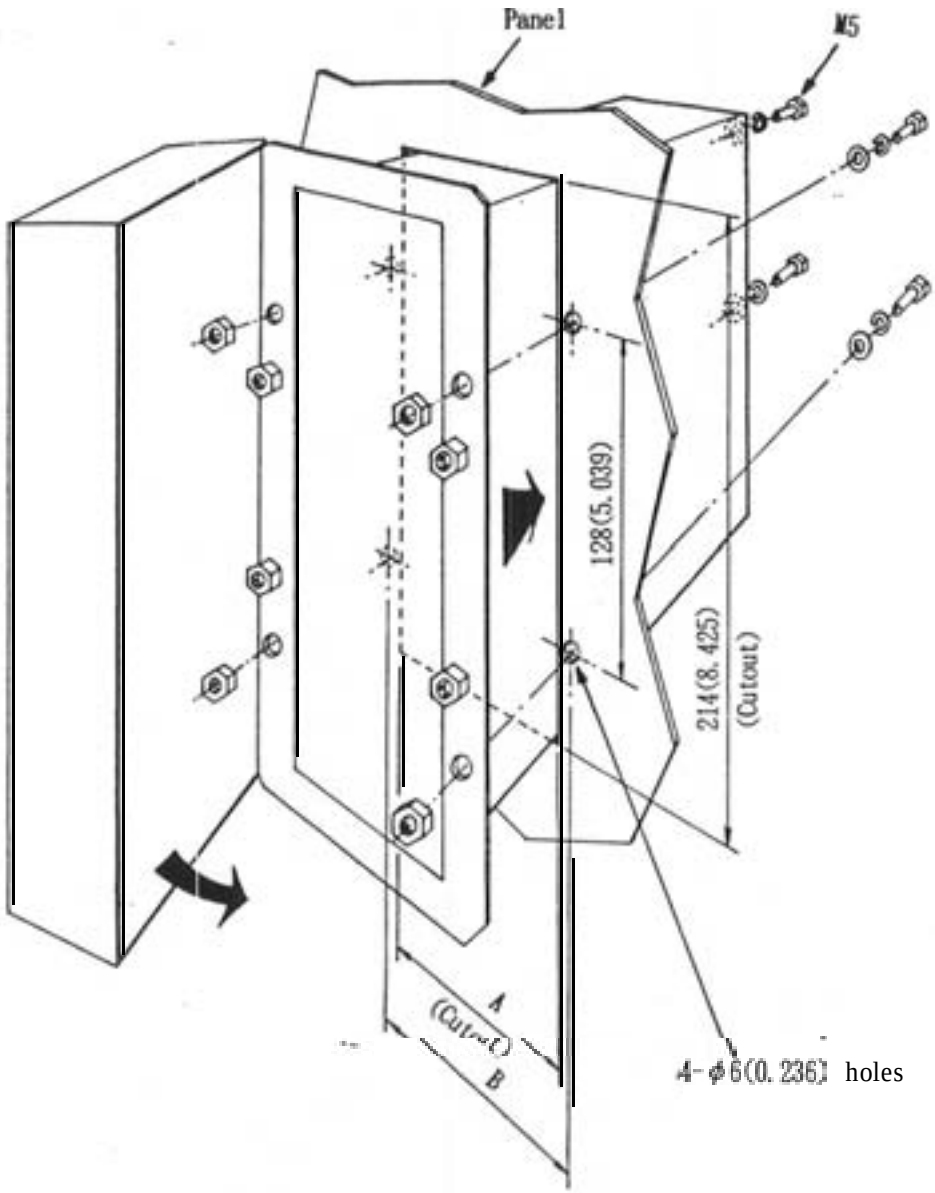
Dimensions in mm (inches)

Type	A	B
S2E21-C1A*	93 (3.661)	104 (4.094)
S2E21-C1A□	269(10.591)	280(11.024)

Figure 8 Mounting Using ISC Standard Screws

4.1.2 Mounting by Non-Standard Screws

The mounting process using other than ISC standard screws is shown in Figure 9. Screws, washers. and nuts are not provided with the relay.



Dimensions in mm (inches)

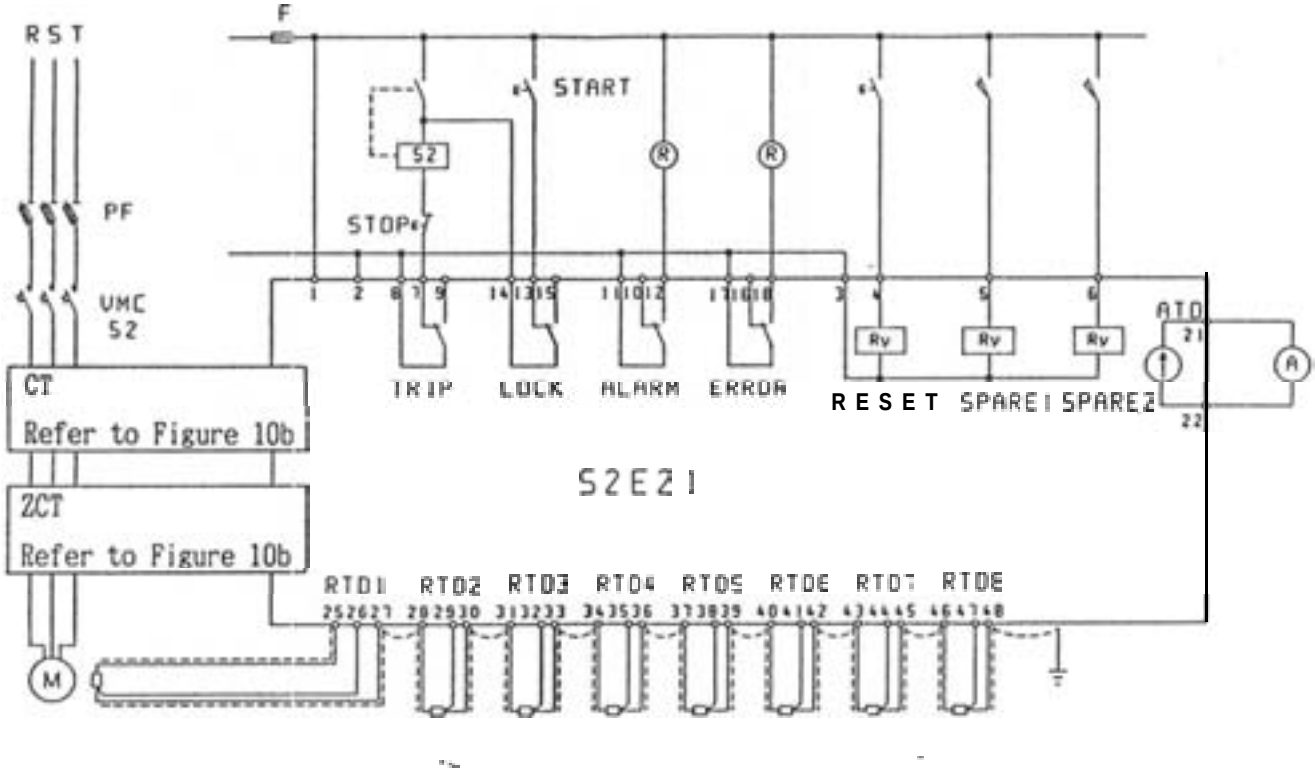
Type	A	B
S2E21-C1A*	93(3.661)	104(4.094)
S2E21-C1A□	269(10.591)	280(11.024)

Figure 9 Mounting Using Non-ISC Standard Screws

4.2 Connect ion

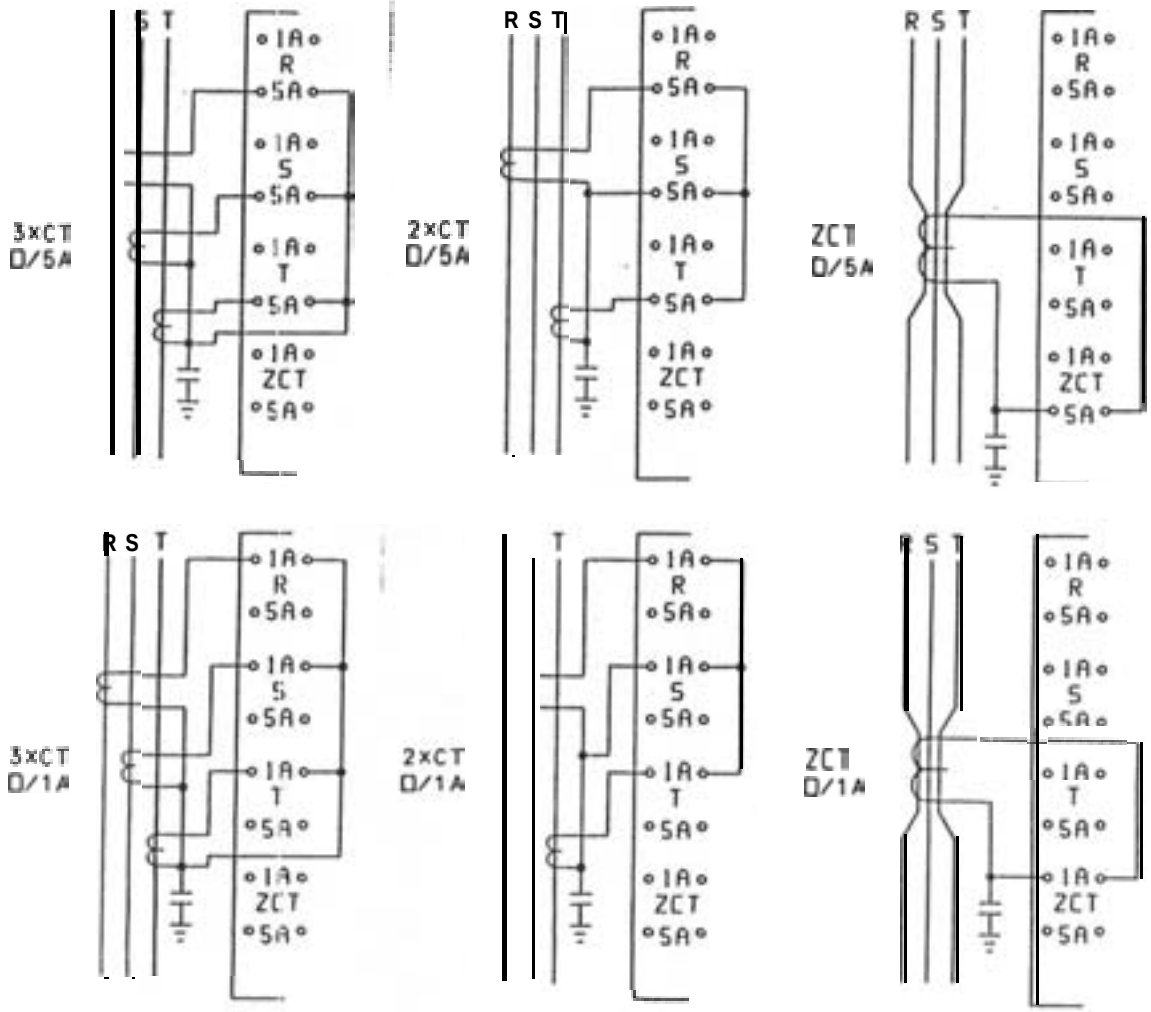
4.2.1 Circuit Cmfiguration

General circuit configuration of the S2E21 is shown in Figures 10a and 10b.



Circuit is shown with relay set for non-fail-safe relay contact configuration. Refer to screen P29 for fail-safe and non-fail-safe configuration selection.

Figure 10a Circuit Configuration



CT connection

CT connection

ZCT connection

Figure 10: Connections of CT and ZCT

4.2.2 Termina I Arrangement

Connectior to the S2E21 is made by using the terminal block provided on the back of the relay case. The terminal arrangement is shown in Figure 11.

1	Power supply	25	RTD1
2	Power supply	26	RTD1
3	Input common	27	RTD1
4	Reset input	28	RTD2
5	Spare 1 input	29	RTD2
6	Spare 2 input	30	RTD2
7	Trip b	31	RTD3
8	Trip c	32	RTD3
9	Trip a	33	RTD3
10	Alarm b	34	RTD4
11	Alarm c	35	RTD4
12	Alarm a	36	RTD4
13	Lock b	37	RTD5
14	Lock c	38	RTD5
15	Lock a	39	RTD5
16	Error b	40	RTD6
17	Error c	41	RTDE
18	Error a	42	RTD6
19	RS485+	43	RTD7
20	RS485-	44	RTD7
21	ATD+	45	RTD7
22	ATD-	46	RTD8
23	No Connection	47	RTDE
24	RS485TARM	48	RTD8

(a) Input/output terminal block

⊕	1A R 5A	⊕
⊕		⊕
⊕	1A S 5A	⊕
⊕		⊕
⊕	1A T 5A	⊕
⊕		⊕
⊕	1A O 5A	⊕
⊕		⊕

(b) Current input terminal block

Figure 11 Terminal Arrangement

4.2.4 Procedure for Making Connections

Connection to the current input terminal block and to the input/output terminal block shall be made as follows.

The connections are classed as follows.

- Current input terminal block: For CT and ZCT secondary circuits
- Input/output terminal block: For power supply circuit and input/output circuit

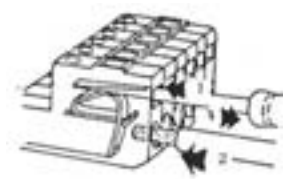
Connection to the current input terminal block (screw fastening type):

Crimp terminal lugs onto wires and then fasten them to the terminals with screws.

Connection to the input/output terminal block (clamp type):

Since wires are directly inserted to the terminals of the terminal block, no crimping work is necessary.

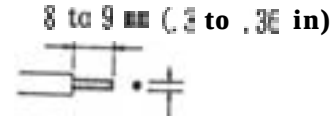
(1) Insert a screwdriver into the opening and push down the spring.



Screwdriver: ϕ 3mm (0.118 in) maximum

It can be smoothly pried open by levering the screwdriver.

(2) insert wire until it abuts the inner wall. Make sure that the bare wire length is as specified.



(3) Pulling out the screwdriver completes the connection.

(4) Pull the wire lightly to check the firmness of the dbnnection.

4.2.5 Connection of Directional Ground Module

The directional ground module is connected to the S2E21 and external circuits as shown in Figure 12.

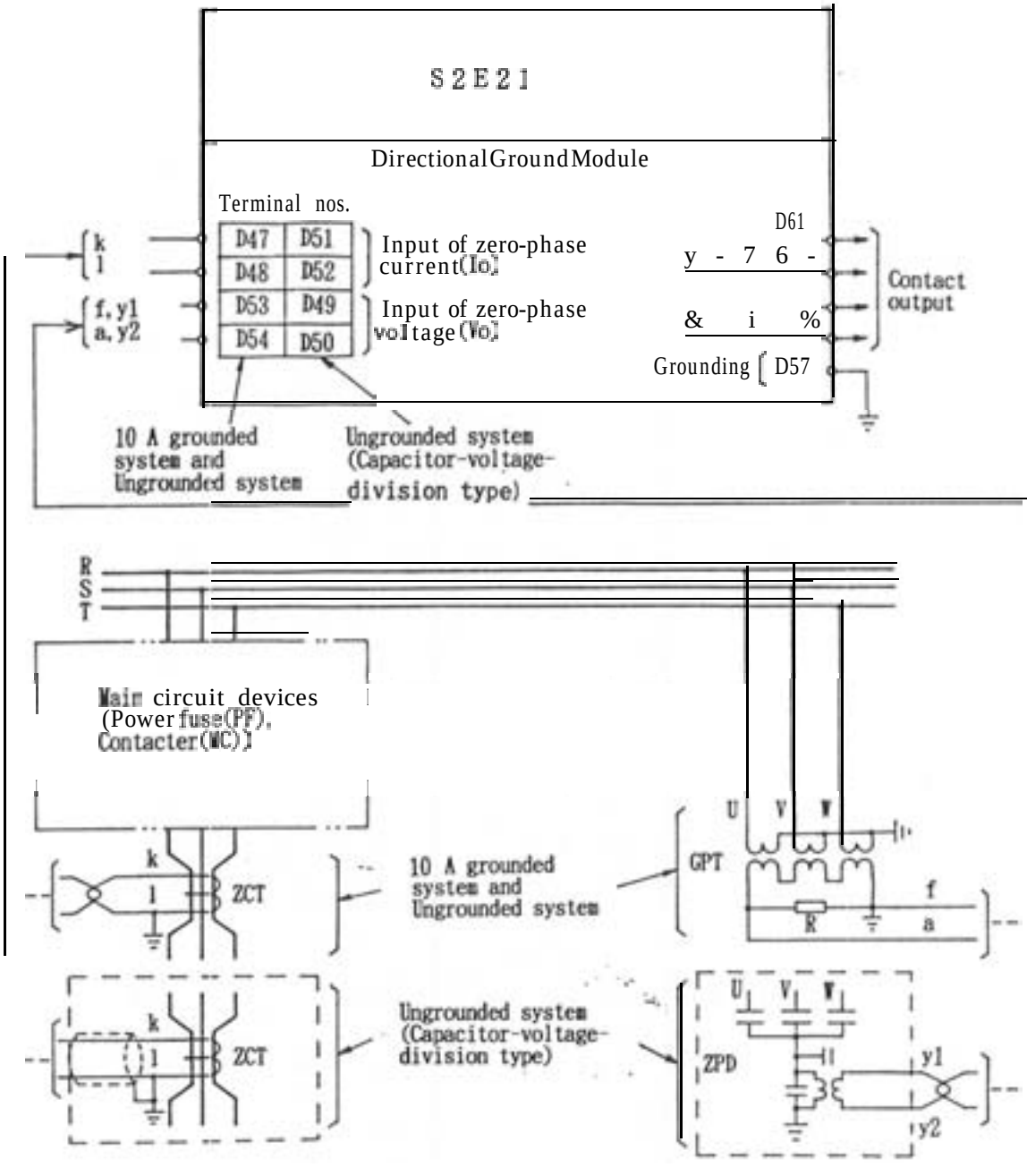


Figure 12 Connection of Directional Ground Module

Method of connection:

Connection to the S2E21 is accomplished within the module. Connection with external circuits is made through the directional ground module terminal block 19 (clamp type).

(1) The terminals for inputting the zero-phase current (Io) and the zero-phase voltage (Vo) are classed as follows.

	Terminal number	
	Io	V_o
10 A grounded system Ungrounded system	D47, D48	D53, D54
Capacitor-voltage-division type	D51, D52	D49, D50

(2) Contact output: Terminal numbers D61, D62, D65, D66

(3) Earthing (ground): Terminal number D57 (Class 3 grounding should be made.)

4.2.6 Precautions for Connection

(1) The control supply and sensor input (CT and ZCT secondary) should use twisted pair wires (twisted at less than 25 mm pitch). CT has a polarity, so be sure to check the polarity before making connection.

The sensor input wires (ZCT, ZPD) entering the capacitor-voltage-division type directional ground module should be shielded wires.

(2) Figure 10 shows an example external connection for the S2E21. Use this diagram as a reference in making connections.

(3) When the external cable to be connected is long, or the number of cores in the multicore cable is large, or the power waveform is deformed. a voltage in excess of the input ON level may occur depending on the cable capacitance between cables even when the contacts are open, causing undesired operation.

In this case. to reduce the input impedance and therefore the generated voltage, a capacitor or resistor may be added to the input terminal and the power supply T-phase or a shielded cable with low cable capacitance may be used.

(4) External cable should be laid isolated from the power cables and high-voltage cables.

Laying external cable close to the power and high-voltage cables will result in an inducted voltage being generated, causing phenomena similar to the above item (3).

5. HANDLING

This chapter describes the procedure for starting and setting the S2E21 and for checking the condition of the motor.

5.1 Installing Battery

The S2E21 incorporates a battery for backup of the internal calendar.
Before use, be certain to remove an insulation sheet from the battery.

The battery backs up the internal calendar when the control supply for the S2E21 is interrupted. While the control-power is supplied, the-calendar works normally without the battery.

If the S2E21 is used with the insulation sheet attached or the battery is exhausted. the time data is lost when the control supply is interrupted.
in that case, the current time should be set again.

5.2 Turning Power On

The S2E21 becomes operational upon being supplied control power.

When the control power is supplied, a power LED lights up and the S2E21 performs the self-check on internal circuits.

After the self-check is finished normally, the screen displays PO system data.

In the event an anomaly is detected, a corresponding error indication lights up issuing an error output contact.

When the control power is turned on, an inrush current of about 50 A flows for 2 ms. When a protective device such as molded case circuit breaker or fuse is provided to the control power, make sure that the protective device will not operate on the inrush current.

5.3 Basic Operation of Screen

5.3.1 Selection of Display

The S2E21 employs a page selection type information access method whereby each display page is assigned with a particular kind of information and one can access any desired information by specifying the corresponding display page.

The procedure for specifying a display page is given below.

There are four methods for page specification.

(1)Specifying a page:

Press [PAGE] [( )] [( )] [EXE] keys.

- Enter a desired page in ( ).
- When an undefined page number is entered, the MENU page (page 1) appears.

Example: When you wish to access page 10, press [PAGE] [1] [0] [EXE] keys.

(2)Turning the page:

Press [PAGE] [↑] [EXE] keys.

- The next page appears.

(3)Moving to the previous page:

Press [PAGE] [↓] [EXE] keys.

- The display moves one page back from the current page.
- When the first page is being displayed, it is again displayed.

(4) Redisplaying the current page:

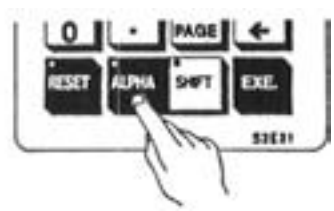
Press [PAGE] [EXE] keys.

- The currently displayed page is shown again.

5.3.2 Entering Alphabets

Keyboard is normally used to enter numerals. To enter alphabet inputs, follow the steps shown below.

(1) Entering alphabets A to M:



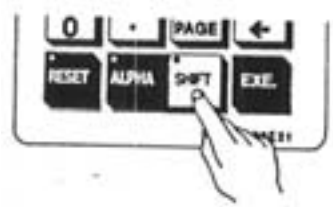
Press [ALPHA] key to move into the alphabet input mode.

- LED on the upper left corner of [ALPHA] key lights up in red.

In this state, the alphabets A-M appearing on the upper left corner of each key can be entered.

Press [ALPHA] key again and LED on the upper left corner goes off, returning you to the numeral input mode.

Entering alphabets N to Z:



(2) Press [SHIFT] during the alphabet input mode.

- LED on the upper left corner of [ALPHA] key lights up in red and LED at the upper left corner of [SHIFT] key lights up in green.

In this state, the alphabets N-Z appearing on the upper left corner of each key can be entered.

Press [SHIFT] key again and LED at the upper left corner goes off, returning you to the alphabet input mode.

5.3.3 Changing Setting

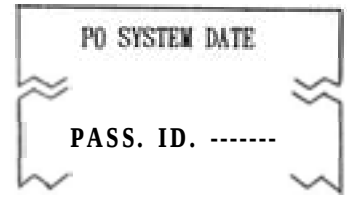
The setting values are important data to determine the characteristic of the protective units and the operation of the S2E21. PASS ID system is incorporated to prevent inadvertent changes in this data.

Changing the setting values is allowed only after the registered PASS ID is entered.

(1) Registering PASS ID:

Registration of PASS ID is done on-PO SYSTEM DATA page.

(a) Move the cursor to the PASS ID.



(b) Key in the currently registered PASS ID.

[ ][ ][ ][ ][ ][ ][ ][ ] Cl [EXE]

(c) Then, key in a desired PASS ID you want registered. You can use any combination of eight alphanumeric characters for the PASS ID.

[ ][ ][ ][ ][ ][ ][ ][ ] [ICI Cl[ ][EXE]

NOTE: At time of shipment, "PASS. ID." is registered as PASS ID.

(2) Changing setting values:

Registered PASS ID must be entered before any change can be made to the setting values.

(a) Call the PC SYSTEM DATA page.

(b) Move the cursor to PASS ID.

(c) Key in the registered PASS ID.

(d) When the entered PASS ID matches the registered one, you are allowed to proceed to change the settings.

(e) Call the setting page.

(f) Press [EXE] key.

Cursor appears. (When PASS ID does not agree or setting; change is not permitted. the cursor does not appear.)

(g) Move the cursor to a parameter you want to change, using arrow keys [↑] [↓] [→] [←].

(h) Enter a new setting value.

(i) Press [EXE] key to implement the setting change.

5.3.4 Adjusting LCD Screen Brightness

The brightness of the display screen can be adjusted to a desired level by turning the variable resistor dial at the back of the keyboard.

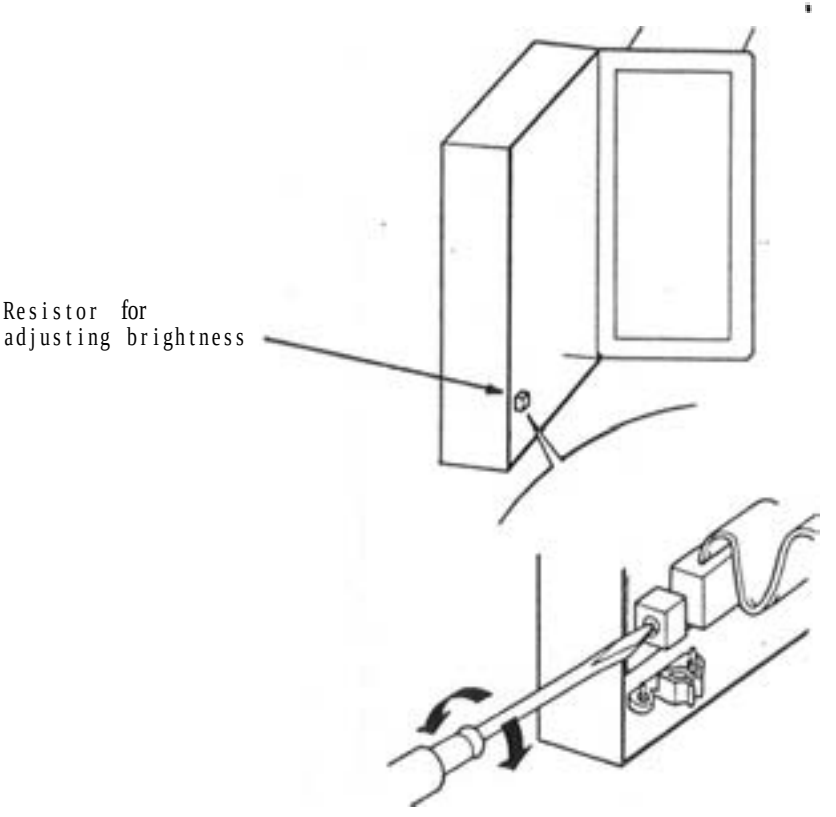


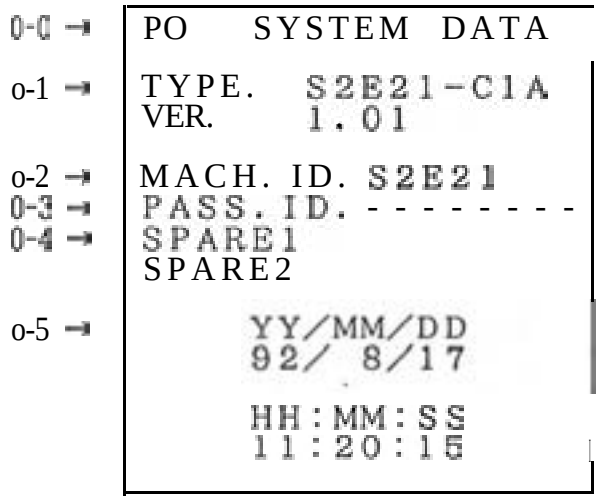
Figure 13 Adjusting the Brightness of Screen

5.3.5 Automatic Turn-off of Display

The display screen is automatically turned off when no key operation is performed for about 4 minutes.

Pressing any key turns on the screen and displays the page that was being shown on the screen before turn-off.

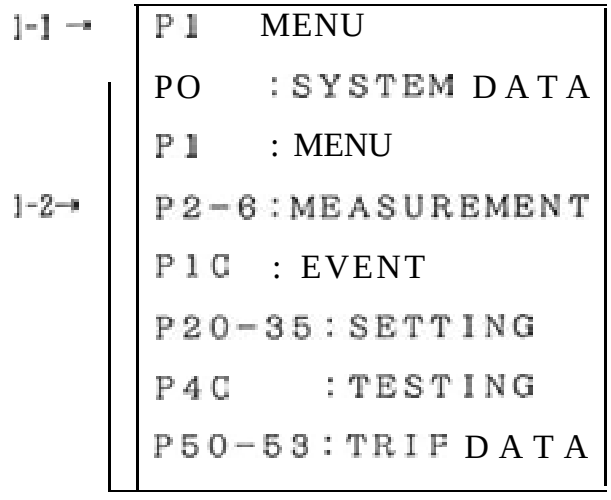
5.4 Registration of ID



No.	Item	Description	State at delivery
O-0	System data	Display of type of S2E21, display and registration of ID, and display of date and time	—
o-1	Type, version	Displays type and version of S2E21.	—
O-2	MACH. ID.	Displays registered Machine ID. To register a new MACH. ID., move the cursor to this position (O-2). enter the new MACH. ID. and press [EXE].	S2E21

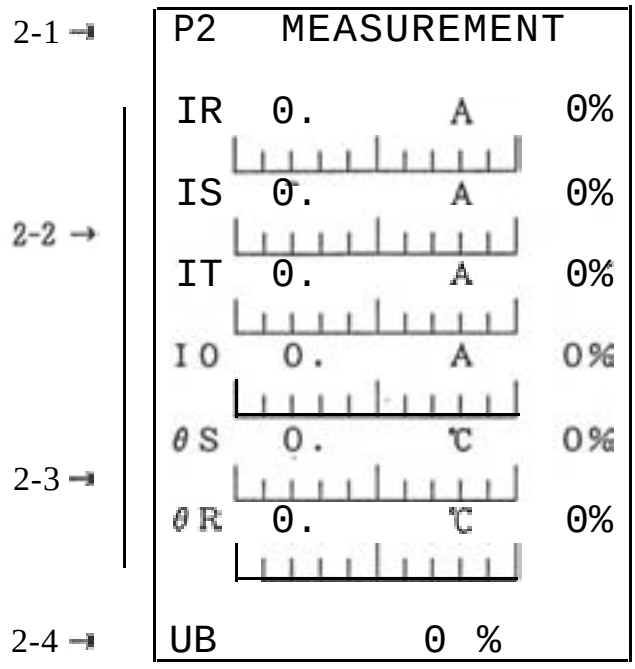
No.	Item	Description	State at delivery
1-3	PASS. ID.	No PASS. IDs registered are shown. For registration of PASS. ID., see Section 5. 5. 3.	PASS. ID.
1-4	Spare input names	Allows you to register names of spare-inputs. The registered spare input names are displayed. SPARE1 corresponds to terminal no.5: SPARE2 corresponds to terminal no.6. Name registration is done by moving the cursor to this position (D-4), key in the name to be registered, and press [EXE].	Blank
1-5	Time	Displays the present date and time. Change is made by moving the cursor to this position (D-5). and entering year (YY), month (MM), day (DD), hour (HH), minute (MM) each followed by [EXE].	

5.5 Menu



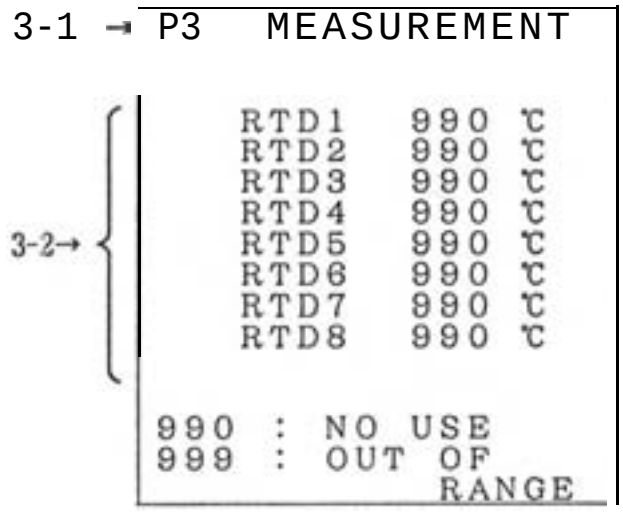
No.	Item	Description	State at delivery
1-1	Menu	A list showing the contents of each page group.	—
1-2	Contents of menu	Represents the contents to be displayed on pages PO to P53. Chose the page number by checking the display contents.	—

‘5.6 Measurement

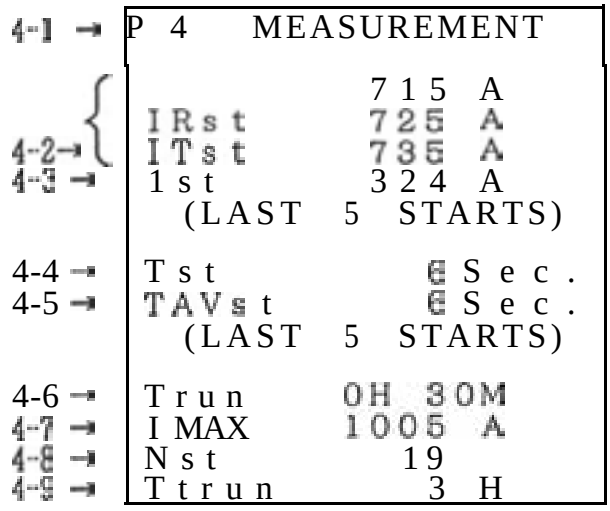


No.	Item	Description	State at delivery
2-1	Display of measured values	Displays current, temperature rise, and unbalance factor.	
2-2	Display of current	Displays the present values of 3 phases and zero phase currents. □□□. A: Represents main circuit currents for each phase. □□%: Represents the ratio of current to rated full load motor current. : Ratio of measured current to rated CT current is displayed in bar.	

No.	Item	Description	State at delivery
2-2	Display of current (cont.11	The scale change in three steps according to the magnitude of current. : 0-125% L - J : 125-250% : 250-600%	
2-3	Tempereture rise	Displays calculated temperature rise in the stator (θS) and rotor (θR). [ ]. ℃: Represents calculated temperature rise. []%: Represents ratio of temperature rise to allowable temperature rise. : Ratio of temperature rise to allowable temperature rise is displayed in bar.	—
2-4	Unbalanced factor	Displayes the present unbalance factor of three phases.	—

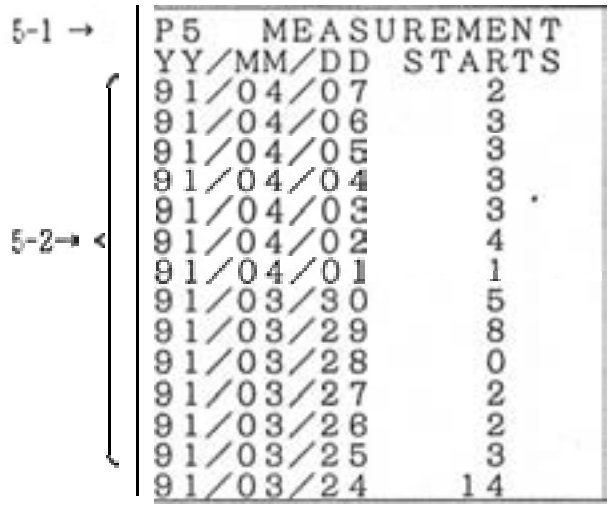


No.	Item	Description	State at delivery
3-1	Display of measured value	Measured value by RTD is displayed.	—
3-2	RTD	The measured value by RTD is displayed in ℃. 990: Indicates that RTD is not used. 25: Displays the temperature as detected by RTD. The detection cycle is about 16 sec. 999: Indicates that the measured temperature is outside the measuring range (-20 to 200℃) or measurement is abnormal. Abnormalities may include broken wire, short-circuit, abnormal S2E21 detection circuit.	—

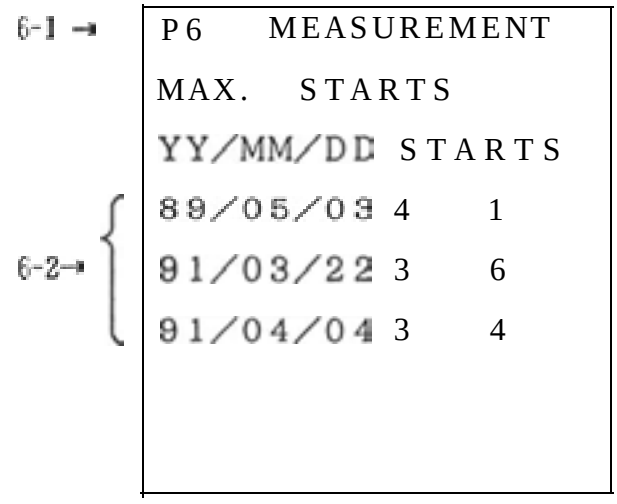


No.	Item	Description	State at delivery
4-1	Display of measured value	Displays the starting current, starting time, and operation time.	—
4-2	Starting current	Displays starting current of each phase.	—
4-3	Average starting current	Displays the average starting current of the last five starts (3-phase average). Value displayed is zero until five starts are completed.	—
4-4	Starting time	Displays last starting time.	—

No.	Item	Description	State at delivery
4-5	Average starting time	Displays the average starting time of the last 5 starts. Value displayed is zero until five starts are completad.	—
4-6	Running time after last start	Displays the running time since the last start. When the motor is running, the running-time is accumulated.	—
4-7	Maximum current	Displays the maximum measured current. (including starting) among the three phases. Stores maximum value until reset. It can be reset at P35.	—
4-8	Number of starts made	Displays the number of starts (accumulative) made until the value is reset. It can be reset at P35.	—
4-9	Total running time	Displays the accumulative running time of motor (elapsed time). It can be reset at P35.	—

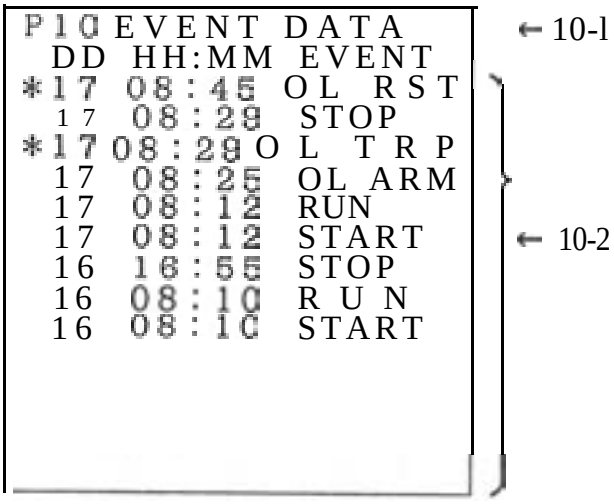


No.	Item	Description	State at delivery
5-1	Display of measured value	Displays the number of starts made in one day.	—
5-2	Number of starts made	Displays the numbers of starts made in one day for the last 14 days as well as dates. Data older than the last 14 days are erased.	—



No.	Item	Description	State at delivery
6-1	Display of measured value	Displays the maximum number of starts made in one day.	—
6-2	Maximum number of starts made	Displays in the descending order the three largest numbers of starts made in one day for the past as well as dates. The display can be reset at P35.	—

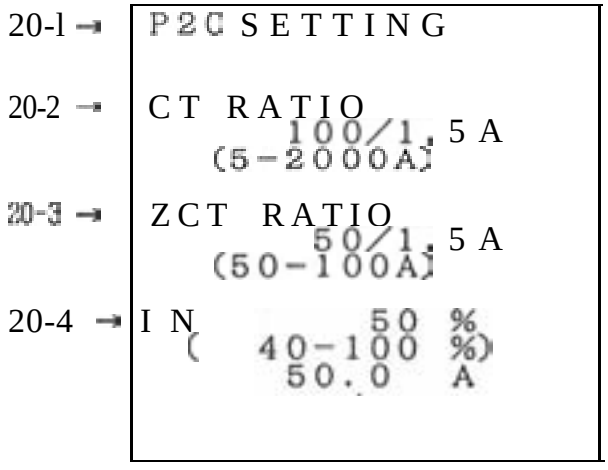
5.7 Event



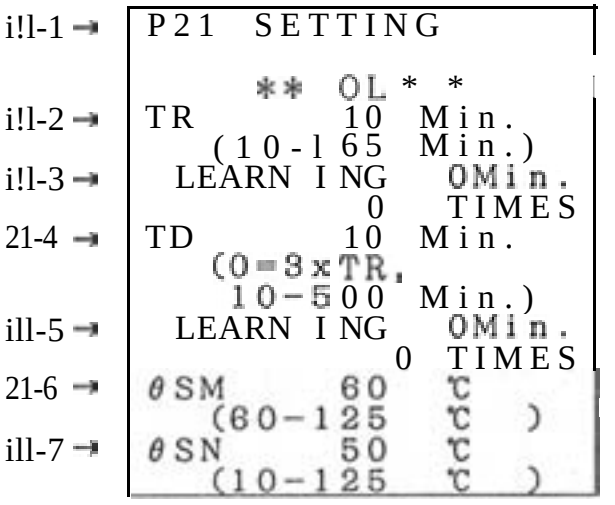
No.	Item	Description	State at delivery
10-1	Display of event. data	Displays the history of motor operation as monitored by S2E21.	—
10-2	Event data	Displays the operation history including start, stop, alarm, trip, and reset of the motor as well as date and time (hours, minutes).	—

IO.	Item	Description	State at delivery
0-2		The event data for the last 14 events are displayed on P10. Data older than the last 14 events are erased. Message description START : Motor start RUN : Motor start COMPLETE STOP : Motor stop TRP : TRIP RST : RESET ARM : ALARM ART : ALARM RESRT OL : Overload oc : Overcurrent UC : Undercurrent INST : Short-circuit UB : Unbalance L. R : Locked-rotor REP : Repeated-starting OCG : Ground fault RTD : RTD SP1 : Spare 1 input SP2 : Spare 2 input	—

5.8 Setting

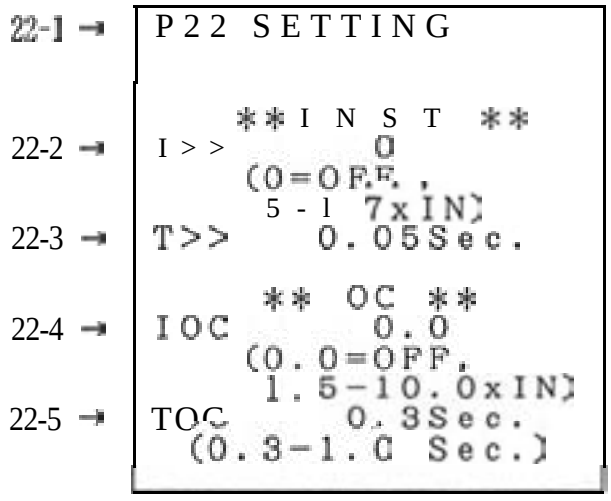


No.	item	Description	State at delivery
20-1	Setting		—
20-2	CT ratio	Sets the primary rating of CT used for 3-phase current detection. Setting range is displayed in parentheses ( ). The CT secondary rating is selected by the connections to the terminal block, so there is no need for setting the CT secondary rating.	5
20-3	ZCT ratio	Sets the primary rating of ZCT used for zero-phase current detection. The CT secondary rating is selected by the connections to the terminal block.	50
20-4	Ratec current	Sets the rated motor current in the form of the CT ratio set at 20-2.	40



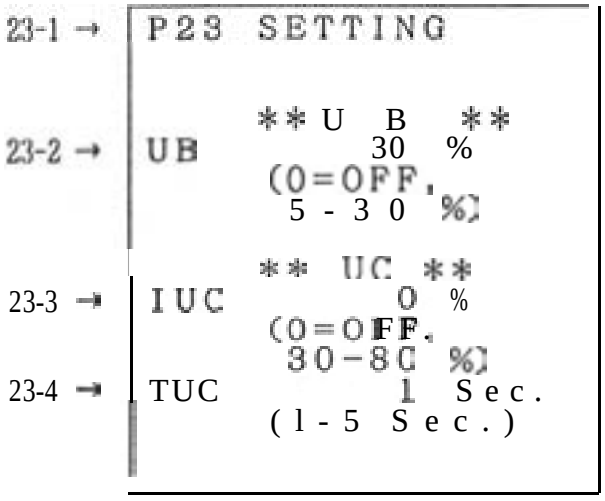
lo.	Item	Description	State at delivery
!l-1	Setting	Sets the overload unit.	—
:1-2	Heating time constant	Sets the motor heating time constant.	10 min
!l-3	Automatical 1 detected value	When the automatic detection of the heating time constant is turned ON at P34, the S2E21 automatically detects the heating time constant. The detected heating time constant is displayed here. The detected heating time constant is reflected on the setting at 21-2. RTD l-3 are necessary for stator temperature detection, and RTDE for ambient temperature.	0 min

No.	Item	Description	State at delivery
21-4	Cooling time constant	Sets the motor cooling time constant. When "0" is set, 3 times the heating time constant of 21-3 becomes the setting value.	10 min
21-5	Automatically detected value	When the automatic detection of the cooling time constant is turned ON at P34, the S2E21 automatically detects the cooling tine-constant. The detected cooling time constant is displayed here. The detected cooling time constant is reflected on the setting at 21-4. RTD l-3 are necessary for stator temperature detection, and RTD 8 for ambient temperature.	0 min
21-6	Stator allowable temperature rise	Sets the allowable temperature rise of the motor stator. This is generally determined by the insulation class of the stator winding.	60 ℃
21-7	Stator rated temperature rise	Sets the temperature rise that would occur when the motor is operated at the rated output (rated current). This data is indicated in the motor test record or supplied by motor manufacturer.	50 ℃

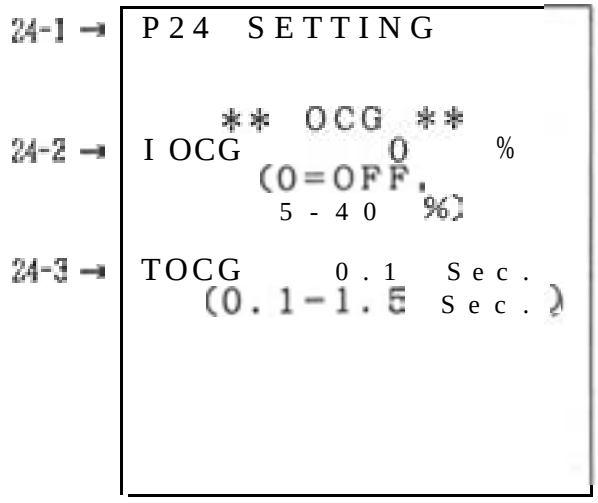


No.	item	Description	State at delivery
22-1	Setting	Sets the short-circuit and overcurrent unit.	—
22-2	Short-circuit unit operating current	Sets the operating current of the short-circuit unit in the form of a multiplier with respect to the rated current. Setting "0" locks the short-circuit function off.	0
22-3	Short-circuit unit operating time	Displays the operating time of the short-circuit unit. Fixed at 0.05 sec.	0.05 sec

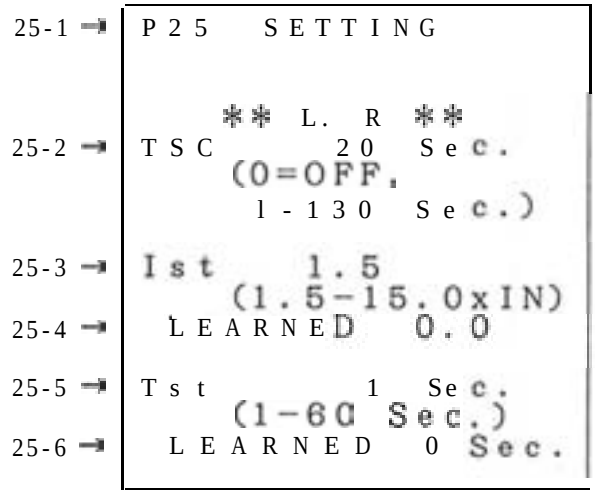
No.	Item	Description	State at delivery
22-4	Overcurrent unit operating current	Sets the operating current of the overcurrent unit in the form of a multiplier with respect to the rated current. Setting "0" locks the overcurrent function off.	0
22-5	Overcurrent unit operating time	Sets the operating time of the overcurrent unit.	0.3 sec



No.	Item	Description	State at delivery
23-1	Setting	Sets the unbalance and undercurrent unit.	—
23-2	Unbalance unit	Sets the unbalance factor. Setting "0" locks the unbalance function off.	0
23-3	Undercurrent unit operating current	Sets the operating current of the undercurrent unit as the ratio of the operating current to the rated current. Setting "0" locks the undercurrent function off.	0
23-4	Undercurrent unit operating time	Sets the operating time of the undercurrent unit,	1 sec



No.	Item	Description	State at delivery
24-1	setting	Sets the ground overcurrent unit.	—
24-2	Ground overcurrent unit operating current	Sets the operating current of the ground overcurrent unit as the ratio of the operating current to the ZCT rating. Setting "0" locks the ground overcurrent function off.	0
24-3	Ground overcurrent unit operating time	Sets the operating time of the ground overcurrent unit.	0.1 sec



No.	Item	Description	State at delivery
25-1	Setting	Sets the locked-rotor and start failure unit and repeated starting unit.	—
25-2	Allowable locked-rotor time	Sets the allowable locked-rotor time of the motor. This data is indicated on the motor test record or supplied by the motor manufacturer. Setting "0" locks the locked-rotor and start failure function and the repeated starting function off. The allowable locked-rotor time is based on starting current (25-3) at cold condition. Actual operating time depends on the current level and temperature rise. Refer to 7.2	3
25-3	Starting current	Sets the starting current of the motor as the ratio of the starting (inrush) current to the rated motor current. This data is indicated on the motor test record or supplied by the motor manufacturer. For reduce voltage starting, Refer to 7.7.	3

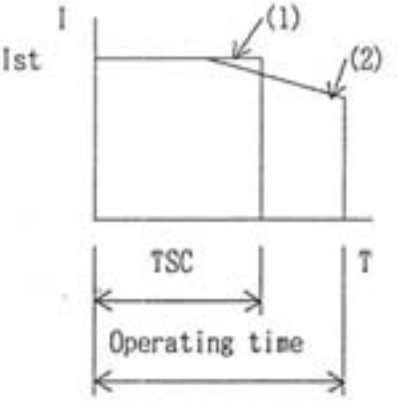
Caution : Do not set Tst(25-5) longer than TSC(25-2). The relay will look up in a trip condition. On initial setting. set TSC(25-2) before setting Tst(25-5).

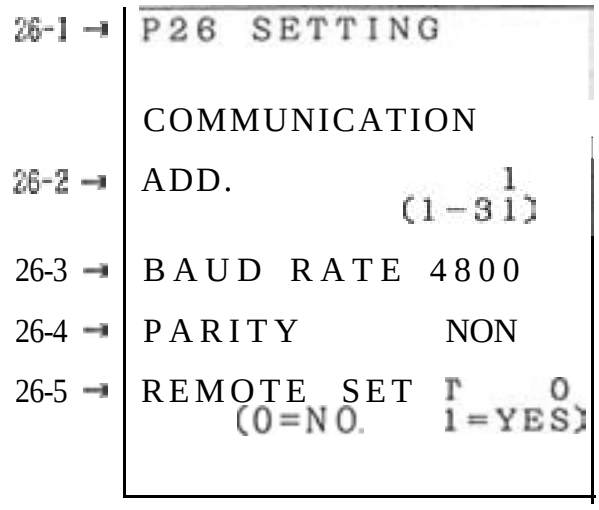
No.	item	Description	State at delivery
25-4	Automatically detected value	When the automatic detection of the starting current is turned ON at P34, the average starting current displayed at P4 is displayed here. The detected starting current is reflected on the setting of 25-3.	0
25-5	Starting time	Sets the starting time of the motor. For reduce voltage starting, Refer to 7.7.	1 sec
25-6	Automatically detected value	When the automatic detection of the starting time is turned ON at P34, the average starting tine displayed at P4 is displayed here. The detected starting time is reflected on the setting of 25-5.	0

Note : The operating time of locked-rotor unit depends on the motor condition.

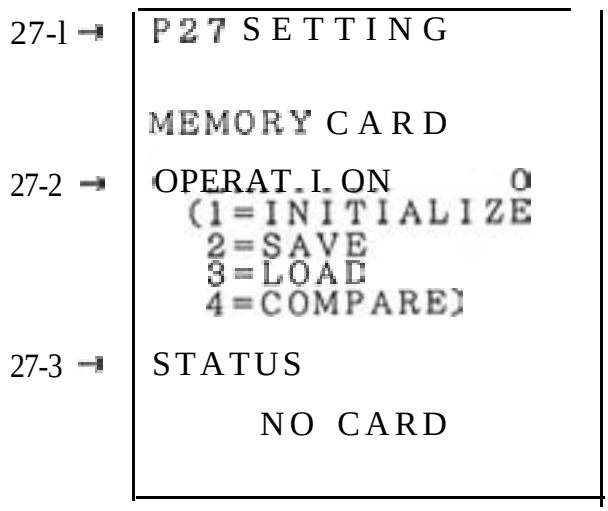
(1) The operating time is TSC(setting value) for a cold start and with no rotation.

(2) The operating time is longer than TSC for a cold start with motor rotation.



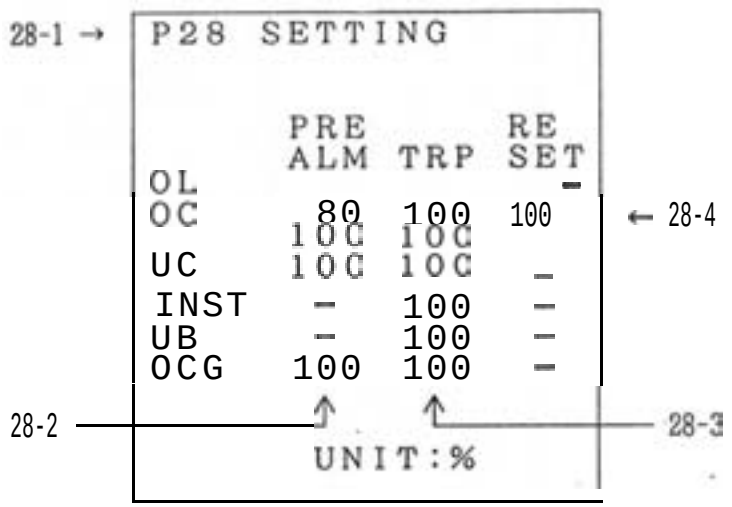


No.	Item	Description	State at delivery
26-1	Setting	Sets the communication.	—
26-2	Address	Sets the remote station address of the S2E21. On the same line. one address is assigned to one remote station.	1
26-3	Baud rate	Displays the communication speed. Fixed at 4800 bps.	4800
26-4	Parity	Displays the parity. Fixed at NON parity.	NON
26-5	Remote setting	Specifies whether the setting change from the monitor is permitted or inhibited.	0



No.	Item	Description	State at delivery
27-1	Setting	Controls data communication with memory card.	—
27-2	Operation	Selects the contents of data to be communicated with memory card. 1: Initializes the memory card. 2: Transfers to the memory card the information of the S2E21 setting, event data, number of starts, protective operation. 3: Transfers setting values from the memory card to the S2E21. 4: Compares the contents of the memory card with those of the S2E21.	—

No.	Item	Description	State at delivery
27-3	Message	Displays the state of the memory card and its response to the operation of 27-3. GOOD: In good condition NO CARD: The card is not inserted. UNMATCH: MACH. IDs of the card and the S2E21 do not agree. ERROR: Error has occured as a result of operation at 27-3. Perform the operation again. COMPLETE: The operation of 27-3 is completed normally.	—



No.	1 ten	Description	State at delivery
28-1	Setting	Sets the pre-alarm level and reset level of the protection unit.	—
28-2	Pre-a I arm	Sets the detection level for pre-alarm as the ratio with respect to the trip level. OL: Ratio with respect to the allowable temperature rise. Setting range: 0 ~ 100 % OC, UC. OCG: Ratio with respect to setting operation current. Setting range : 0 ~ 100 % (OC, OCG) 100 ~ 300 % (UC) For the pre-alarm to be output, the output relay must be set at P30.	100

No.	Item	Description	State at delivery
28-3	Trip value	Displays the trip value as 100%.	—
28-4	Resetting	Sets the reset level for the overload unit. The S2E21 cannot be reset until the detected level becomes lower than the reset level. Setting range: 0 ~ 100 % Units other than the overload unit have no reset level and thus can be reset at any time.	100